

REMARKS:Status

After this response, claims 54, 56 to 86, 104, 105, 111 to 114, 121 to 124, 126 to 131, 133 to 141, and 143 to 147 are pending. Claims 54, 62, 72, 74 to 77, 79, 104, 121, 131 and 141 have been amended and claims 87 to 98 have been cancelled herein. Claims 54, 62, 72, 82, 104, 111, 114, 121, 131 and 141 are the independent claims. Entry of this response, reconsideration and further examination are respectfully requested.

Section 101 Rejection

Claims 54, 56 to 81, 104, 105, and 121 to 124, 126 to 131, and 133 to 147 were rejected under 35 U.S.C. § 101. Of these, claims 54, 62, 72, 104, 121, 131 and 141 are the independent claims. Each of these claims has been amended to recite functional use of the recited information, snapshot(s) or storage images.

In more detail, claim 54 has been amended to recite a controller that uses “at least one of said plurality of bits in a ... snapshot to identify whether said one storage block was part of said file system at a time earlier than a current consistent version of said file system.” Thus, the bits impact the function of the controller.

Claim 62 has been amended to add the language removed by the previous response in this case, namely that “said file system is responsive to at least one file system request with regard to said snapshot.” Independent claim 72, which used to depend from claim 62, also recites such a

feature. This language was held to render claim 62 statutory in the previous Office Action (see current Office Action Response to Amendment ¶ 2).

Similar to claim 62, Claim 104 has been amended to recite that “said file system is responsive to at least one file system request with regard to said snapshots.”

Claim 121 has been amended to recite that “said shadow snapshot is disposed as a single object in said file system, whereby said controller can manipulate said shadow snapshot without having to traverse a hierarchy of file system objects within said shadow snapshot” and that “said file system is responsive to at least one file system request with regard to said shadow snapshot.”

Claim 131 has been amended to recite that “said mark on allocate storage image is disposed as a single object in said file system, whereby said controller can manipulate said storage image without having to traverse a hierarchy of file system objects within said storage image” and that “said file system is responsive to at least one file system request with regard to said storage image.”

Claim 141 has been amended to recite that “said mark on deallocate storage image is disposed as a single object in said file system, whereby said controller can manipulate said storage image without having to traverse a hierarchy of file system objects within said storage image” and that “said file system is responsive to at least one file system request with regard to said storage image.”

In each of these claims, the recited information, snapshot(s) or storage images are functionally interrelated to the file system and/or controller for the file system. Accordingly, these

claims and their dependent claims do not recite non-functional descriptive material. Withdrawal of the § 101 rejections of these claims is therefore respectfully requested.

Section 103 rejection

All pending claims were rejected under 35 U.S.C. § 103 over Raymond A. Lorie, "Physical Integrity in a Large Segmented Database," ACM Transactions on Database Systems, vol. 2, no. 1, Mar. 1997, pp 91-104 (Lorie).

Claims 54 and 56 to 61: Independent claim 54 is reproduced below:

54. (Currently Amended) A file system that stores and retrieves information in a plurality of storage blocks, said file system including:
mass storage having said plurality of storage blocks;
a controller that controls storage and retrieval of information, said information including data and a plurality of snapshots each including a plurality of bits associated with each one of said plurality of storage blocks, said controller using at least one of said plurality of bits in a first snapshot to identify whether said one storage block was part of said file system at a time earlier than a current consistent version of said file system, and said controller using at least a second one of said plurality of bits in a second snapshot to identify whether said one storage block was part of said file system at a second time earlier than a current consistent version of said file system.

Having made an extended and diligent search of Lorie, including its entire text and all figures, we strongly believe that Lorie does not disclose or suggest the foregoing features of claim 54, at least with respect to said controller "using at least one of said plurality of bits in" both a first and a second snapshot "to identify whether said one storage block was part of said file system at a" time or second time "earlier than a current consistent version of said file system."

In more detail, the items in Lorie that appear to Applicants to be closest to a snapshot are Lorie's MAP₀ and MAP₁. This would at first appear to be a disclosure of two snapshots. However, in Lorie's discussion of saving a new state, Lorie specifically states that "[t]he content of MAP₀ is now irrelevant." Lorie, page 99, lines 7 and 8. (It is apparent that when MAP_SWITCH is set to 0 to save another new state, MAP₁ will become irrelevant.) Thus, Lorie teaches directly against using both MAPs to determine whether a storage block was part of an earlier consistent file system. It is, of course, axiomatic that a reference that teaches against a feature of a claim should not be used to hold that claim obvious under § 103.

Applicants notes that page 97 of Lorie teaches copying MAP₀ into a current bitmap. However, a current bitmap clearly is not a snapshot that indicates whether a storage block was part of an earlier consistent file system.

In view of the foregoing, Lorie clearly does not render claim 54 obvious. Accordingly, withdrawal is respectfully requested of the § 103 rejection of claim 54 and its dependent claims.

Claims 62 to 71: Independent claim 62 is reproduced below:

62. (Currently Amended) A file system having a plurality of storage blocks, said file system including a snapshot including a plurality of bits associated with a set of member storage blocks selected from said plurality, said member storage blocks forming a consistent file system other than an active file system, said snapshot being disposed as an object in said file system, wherein said file system is responsive to at least one file system request with regard to said snapshot.

Having made an extended and diligent search of Lorie, including its entire text and all figures, we strongly believe that Lorie does not disclose or suggest the foregoing features of claim

62, at least with respect to “a snapshot including a plurality of bits associated with a set of member storage blocks ... being disposed as an object in said file system.”

The Office Action responded to Applicants’ argument in the previous response by stating that “the claimed ‘as an object in said file system’ merely reads on the fact that any snapshot is created from a collection of selected storage blocks, thus each snapshot in the file system of Lorie is clearly disposed as an object in the file system.” Applicants respectfully submit that this statement is a misinterpretation of the claim language.

The claim language indicates that the snapshot is represented as an object in the file system. For example, as discussed in the specification, the snapshot could be represented as a block map (i.e., a plurality of bits as claimed). See Application, page 11, ¶ 3. In that case, the claim language would mean that the block map is stored as an object in the file system. In order for Lorie to teach this feature, Lorie would have to teach that a bit map representation of a consistent state, for example MAP_0 or MAP_1 , is stored as an object (e.g., segment) in its database. Lorie clearly does not teach such.

Furthermore, Applicants’ amendment makes it clear that the snapshot in claim 62 does not refer to the actual storage blocks, but rather to “a plurality of bits associated with” member storage blocks. Applicants see no mention in Lorie of storing such a plurality of bits, for example Lorie’s MAPs or Lorie’s bit map (which starts as a copy of one of the MAPs), as objects in Lorie’s database.

In this regard, Applicants note that Lorie discusses saving “the master, the bit map, the V_k , and the contents of used slots” on tape T. Lorie, page 102, lines 11 to 13. However, Lorie

does not indicate that these items are saved as objects in Lorie's database. Rather, these objects appear to Applicants to be stored with the database for use in ensuring integrity of the database.

In other words, Lorie does not teach that these items can be accessed as objects that are part of the contents of the database. In contrast, the invention as recited by claim 62 specifies "said snapshot being disposed as an object in said file system." An object in a file system is something that can be accessed as part of that file system. Thus, Lorie is entirely and significantly different from the claimed storage of a snapshot (e.g., bit associated with member storage blocks) as an object in a file system.

For at least the foregoing reasons, claim 62 and its dependent claims are believed to be allowable over Lorie. Reconsideration and withdrawal are therefore requested of the rejections of those claims.

Claims 72 to 81: New independent claim 72 is reproduced below:

72. (Currently Amended) A file system having a plurality of storage blocks, said file system, including:

- a plurality of said snapshots, each snapshot including a plurality of bits associated with a set of member storage blocks selected from said plurality, said member storage blocks forming a consistent file system other than an active file system, each said snapshot being disposed as an object in said file system; and

- a storage image determined based on said plurality of snapshots, said storage image defining another set of member storage blocks selected from said plurality;

- wherein said file system is responsive to at least one file system request with regard to said snapshots.

Having made an extended and diligent search of Lorie, including its entire text and all figures, we strongly believe that Lorie does not disclose or suggest the foregoing features of claim

72, at least with respect to “a plurality of said snapshots, each snapshot including a plurality of bits associated with a set of member storage blocks selected from said plurality,” and “each said snapshot being disposed as an object in said file system.”

These snapshots are similar to the snapshot recited by claim 62, except that claim 72 specifies a plurality of snapshots. With reference to Lorie’s text at page 102, even if Lorie’s storage of “the master, the bit map, the V_k , and the contents of used slots” on tape T is held to be equivalent to disposing a snapshot as an object in a file system, this text certainly does not teach disposing plural such snapshots in that manner. In fact, in view of Lorie’s statement that a previous MAP (i.e., MAP0 after MAP_SWITCH = 1) is “irrelevant,” Lorie appears to Applicants to actually teach against storage of plural snapshots. Storage of irrelevant data is clearly not obvious.

For at least the foregoing reasons, claim 72 and its dependent claims are believed to be allowable over Lorie. Reconsideration and withdrawal are therefore requested of the rejections of those claims.

Claims 82 to 86: Independent claim 82 is reproduced below:

82. (Previously Presented) A method of operating a file server, said method including steps for

forming a first snapshot of a first consistent state of said file system at a selected time, said first snapshot including an indication of a set of storage blocks in said first consistent state;

forming a second snapshot of a second consistent state of said file system, said second snapshot including an indication of a set of storage blocks in said second consistent state; and

performing an operation on said first and second snapshots to form a storage image including an indication of at least some storage blocks in said file system.

Having made an extended and diligent search of Lorie, including its entire text and all figures, we strongly believe that Lorie does not disclose or suggest the foregoing features of claim 82, at least with respect to “performing an operation on said first and second snapshots to form a storage image including an indication of at least some storage blocks in said file system.”

Applicants presented this argument in the previous response. The Office Action responded by stating that “Lorie clearly teaches the concept of having both first and second snapshots when Lorie shows two copies of the master.” Applicants first note that Lorie’s master is declared by Lorie to have elements STATUS(N) BIT(1) and MAP_SWITCH BIT(1). See Lorie, page 96. STATUS(N) indicates whether segments are open or closed. This is not an indication of storage blocks in a consistent state. MAP_SWITCH is a single bit for switching between MAP₀ and MAP₁. Again, this clearly is not an indication of storage blocks in a consistent state.

Lorie does teach use of MAP₀ and MAP₁. However, claim 82 does not merely recite the existence of two snapshots. Rather, claim 82 recites “performing an operation on said first and second snapshots to form a storage image.” In view of Lorie’s explicit teaching that after MAP_SWITCH is changed to 1, “[t]he content of MAP₀ is now irrelevant,” Applicants submit that Lorie clearly teaches against performing such an operation on MAP₀ and MAP₁. Thus, Lorie does not render claim 82 obvious.

For at least the foregoing reasons, claim 82 and its dependent claims are believed to be allowable over Lorie. Reconsideration and withdrawal are therefore requested of the rejections of those claims.

Claims 87 to 98: These claims have been cancelled, rendering the rejection thereof moot.

Claims 104 and 105: Independent claim 104 is reproduced below:

104. (Currently Amended) Apparatus including a file system that stores and retrieves information, said file system including:
mass storage having said plurality of storage blocks;
a controller that controls storage and retrieval of information, said information including data and a plurality of snapshots of said file system, each representing an associated consistent state at an associated selected time, and each said snapshot including an indication of a set of storage blocks in said associated consistent state, said indication being recorded in at least one storage block in said associated consistent state, wherein said file system is responsive to at least one file system request with regard to said snapshots.

Having made an extended and diligent search of Lorie, including its entire text and all figures, we strongly believe that Lorie does not disclose or suggest the foregoing features of claim 104, at least with respect to “said indication of a set of storage blocks in said associated consistent state [included in each of plural snapshots] being recorded in at least one storage block in said associated consistent state.”

Lorie is concerned with storing segments of a database. The claimed invention is concerned with storing blocks of a file system. Thus, Applicants assume the Examiner is equating Lorie’s database segments with the claimed storage blocks.

Lorie discusses uses of a master, MAP₀, MAP₁, a copy of one of the MAPs, etc. to ensure integrity of the database in a consistent state. However, Lorie does not include any teaching of storing these elements in the segments of the database itself.

Lorie does discuss saving “the master, the bit map, the V_k , and the contents of used slots” on tape T. Lorie, page 102, lines 11 to 13. However, Lorie makes no mention that these elements are stored as segments of the database, but rather merely states that these elements are stored on tape T. Lorie is not seen to Applicants to teach storing these elements in any other particular location (although certainly the elements are stored in memory). Thus, Lorie does not appear to Applicants to teach the claimed feature of “said indication of a set of storage blocks in said associated consistent state [included in each of plural snapshots] being recorded in at least one storage block in said associated consistent state.”

For at least the foregoing reasons, claim 104 and its dependent claim are believed to be allowable over Lorie. Reconsideration and withdrawal are therefore requested of the rejections of those claims.

Claims 111 to 113: Independent claim 111 is reproduced below.

111. (Previously Presented) In a file system having a plurality of storage blocks, a data structure including
a first snapshot of a set of member storage blocks selected from said plurality, said member storage blocks forming a consistent file system other than an active file system;
said first snapshot being represented as an object in said file system and having a set of storage blocks for recording said first snapshot;
whereby copying said member storage blocks in said first snapshot has the property of preserving at least one snapshot recorded in said file system at a time of said first snapshot.

Having made an extended and diligent search of Lorie, including its entire text and all figures, we strongly believe that Lorie does not disclose or suggest the foregoing features of claim 111, at least with respect to “said first snapshot being represented as an object in said file system.”

In this regard, the Office Action states that “the claimed ‘as an object in said file system’ merely reads on the fact that any snapshot is created from a collection of selected storage blocks, thus each snapshot is the file system of Lorie is clearly represented as an object in the file system.” Applicants respectfully submit that this statement is a misinterpretation of the claim language.

The claim language indicates that the snapshot is represented as an object in the file system. For example, as discussed in the specification, the snapshot could be represented as a block map. See Application, page 11, ¶ 3. In that case, the claim language would mean that the block map is stored as an object in the file system. If the snapshot is represented by some other object, the claim language would mean that the object itself is stored as an object in the file system. In order for Lorie to teach this feature, Lorie would have to teach that some representation of a consistent state, for example MAP₀ or MAP₁, is stored as an object (e.g., segment) in its database. Lorie clearly does not teach such.

For at least the foregoing reasons, claim 111 and its dependent claims are believed to be allowable over Lorie. Reconsideration and withdrawal are therefore requested of the rejections of those claims.

Claim 114: Independent claim 114 is reproduced below.

114. (Previously Presented) In a file system having a plurality of storage blocks, a data structure including
a snapshot of a set of member storage blocks selected from said plurality, said member storage blocks forming a consistent file system other than an active file system;
said snapshot being represented as an object in said file system and having a set of storage blocks for recording said snapshot;

whereby a backup and restore operation on said file system has the property of preserving said snapshot within said file system.

Having made an extended and diligent search of Lorie, including its entire text and all figures, we strongly believe that Lorie does not disclose or suggest the foregoing features of claim 114, at least with respect to “said snapshot being represented as an object in said file system.” Substantially as discussed above with reference to claim 111, Lories does not appear to Applicants to teach such a feature. Accordingly, claim 114 is believed to be allowable over Lorie. Reconsideration and withdrawal are therefore requested of the rejections of this claim.

Claims 121 to 130: Claim 121 is reproduced below.

121. (Currently Amended) A file system that stores and retrieves information in a plurality of storage blocks, including:

mass storage having said plurality of storage blocks;

a controller that controls storage and retrieval of information, said information including a data structure including a shadow snapshot of a set of member storage blocks selected from said plurality, said member storage blocks having formed a consistent file system other than an active file system, with a set of selected member storage blocks removed from said consistent file system;

wherein said shadow snapshot is disposed as a single object in said file system, whereby said controller can manipulate said shadow snapshot without having to traverse a hierarchy of file system objects within said shadow snapshot, and wherein said file system is responsive to at least one file system request with regard to said shadow snapshot.

Having made an extended and diligent search of Lorie, including its entire text and all figures, we strongly believe that Lorie does not disclose or suggest the foregoing features of claim 121, at least with respect to “said shadow snapshot ... disposed as a single object in said file system.”

Substantially as discussed above with regard to claim 111, Lorie does not appear to teach any type of snapshot disposed as a single object in a file system. Accordingly, claim 121 and its dependent claims are believed to be allowable over Lorie. Reconsideration and withdrawal are therefore requested of the rejections of those claims.

Claims 131 to 140: Claim 131 is reproduced below.

131. (Currently Amended) A file system that stores and retrieve information in a plurality of storage blocks including:

mass storage having said plurality of storage blocks;

a controller that controls storage and retrieval of information, said information including a data structure that includes a mark on allocate image of a set of member storage blocks selected from said plurality, said member storage blocks having been added to a snapshot that originally formed a consistent file system;

wherein said mark on allocate storage image is disposed as a single object in said file system, whereby said controller can manipulate said storage image without having to traverse a hierarchy of file system objects within said storage image, and wherein said file system is responsive to at least one file system request with regard to said storage image.

Having made an extended and diligent search of Lorie, including its entire text and all figures, we strongly believe that Lorie does not disclose or suggest the foregoing features of claim 131, at least with respect to “said mark on allocate storage image ... disposed as a single object in said file system.”

The only element of Lorie that Applicants see that might be equivalent to the claimed “mark on allocate storage image” is Lorie’s bit map, which is a copy of one of the MAPs that is used “to find a free slot and mark it as busy.” See Lorie, page 97, ¶ 3. However, Lorie makes absolutely no mention of storing this copy of a MAP in the database. In fact, the only explicit mention in Lorie of storing the bit map is on page 102, which discusses storing the bit map on tape T. This teaching

certainly does not indicate that the bit map is stored in the database. Rather, the bit map appears to Applicants to be stored with the database for use in ensuring integrity of the database.

In view of the foregoing, claim 131 and its dependent claims are believed to be allowable over Lorie. Reconsideration and withdrawal are therefore requested of the rejections of those claims.

Claims 141 to 147: Claim 141 is reproduced below.

141. (Currently Amended) A file system that stores and retrieve information in a plurality of storage blocks including a data structure that includes a mark on deallocate image of a set of member storage blocks selected from said plurality, said member storage blocks having been removed from a snapshot that originally formed a consistent file system;

wherein said mark on deallocate storage image is disposed as a single object in said file system, whereby said file system can manipulate said snapshot without having to traverse a hierarchy of file system objects within said snapshot.

Having made an extended and diligent search of Lorie, including its entire text and all figures, we strongly believe that Lorie does not disclose or suggest the foregoing features of claim 141, at least with respect to “said mark on deallocate storage image ... disposed as a single object in said file system.”

First, Lorie does not even appear to Applicants to teach a “mark on deallocate storage image,” that is a storage image such as a block map that is marked as blocks (or equivalently segments) are deallocated. If Applicants are mistaken in this regard, then Applicants respectfully request that the Examiner identify where Lorie teaches deallocation.

The only element of Lorie that Applicants see that might be used as a “mark on deallocate image” is Lorie’s bit map, which is a copy of one of the MAPs that is used “to find a free

slot and mark it as busy.” See Lorie, page 97, ¶ 3. It is conceivable that this bit map could also be used to mark a slot as no longer busy. However, the mere possibility that a feature of a reference can be used to imitate claim language does not render that claim language obvious. See MPEP § 2143.01 (“The mere fact that references can be combined or modified does not render the resultant combination obvious unless the prior art also suggests the desirability of the combination. In re Mills, 916 F.2d 680, 16 USPQ2d 1430 (Fed. Cir. 1990).”)

Furthermore, Lorie makes absolutely no mention of storing this copy of a MAP in the database. In fact, the only explicit mention in Lorie of storing the bit map is on page 102, which discusses storing the bit map on tape T. This teaching certainly does not indicate that the bit map is stored in the database. Rather, the bit map appears to Applicants to be stored with the database for use in ensuring integrity of the database.

In view of the foregoing, claim 141 and its dependent claims are believed to be allowable over Lorie. Reconsideration and withdrawal are therefore requested of the rejections of those claims.

Request for Clarifications

The Office Action repeatedly refers to Lorie as “clearly” teaching the various claim elements. However, the Office Action only discusses Lorie in general terms. The Office Action provides little indication of *which* elements of Lorie are being equated with the claim features, in particular with the various pluralities of bits, snapshots, shadow snapshots, and storage images recited by the claims.

In this regard, Applicants respectfully note that, “[t]o establish prima facie obviousness of a claimed invention, all the claim limitations must be taught or suggested by the prior art.” MPEP § 2143.03. Applicants submit this requirement is not met by the Office Action’s repeated assertions that Applicants’ claim language “merely” means a general characteristic of a file system combined with a general citation to Lorie as teaching that general characteristic, as appears in most of the § 103 rejections.

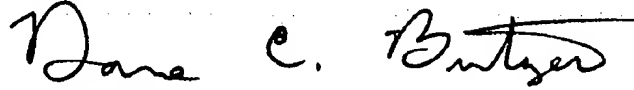
In conclusion, Applicants certainly do not agree that Lorie “clearly” teaches the claimed invention. Applicants find little guidance in the general discussions of Lorie of how the elements of Lorie are being equated with the claim elements. Applicants therefore respectfully request that the Examiner clarify which elements of Lorie are being equated with the various pluralities of bits, snapshots, shadow snapshots, and storage images recited by the claims. Such clarifications would greatly assist Applicants in working with the Examiner to advance prosecution of this case to conclusion.

Closing

The entire application is now believed to be in condition for allowance, and such action is respectfully requested at the Examiner’s earliest convenience.

Applicants' undersigned attorney can be reached at (614) 205-3241. All correspondence should continue to be directed to the address indicated below.

Respectfully submitted,

A handwritten signature in black ink, appearing to read "Dane C. Butzer". The signature is fluid and cursive, with the first name "Dane" being the most prominent.

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